Steps Towards Reheating in DD̄ Inflation

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D. Chialva, G. Shiu, B.U., hep-th/0508229

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Inflation
Attraction between D3-$\overline{\text{D}}$3 branes

- **Toroidal Compactification**: D-branes located at antipodal point on torus, branes at angles
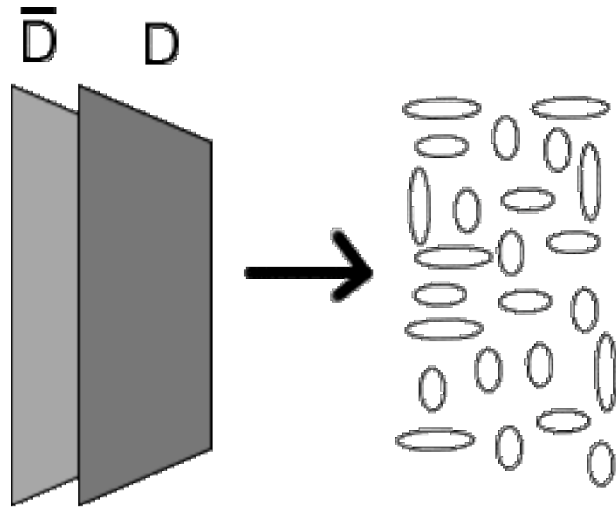
  Shandera, Shlaer, Stoica, Tye, hep-th/0311207

- **KKLMMT**: Background fluxes on CY conifold, creates warped throats.

  KKLMMT, hep-th/0308055

- **DBI Inflation**: Motion of D-brane in warped throat speed limited

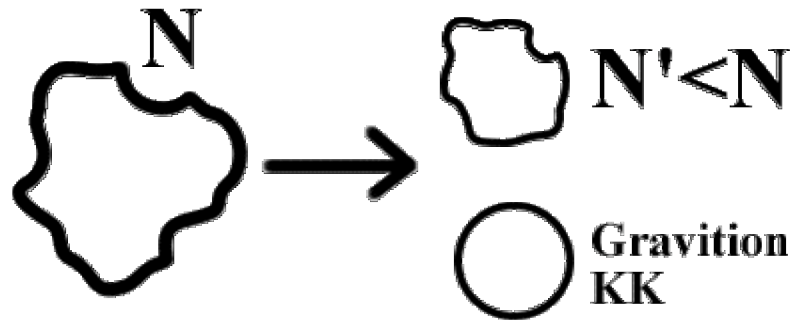 Silverstein, Tong, hep-th/0310221

Annihilation

$\bar{D}$ D

- D-$\bar{D}$ pair annihilate into massive closed strings ("tachyon matter")
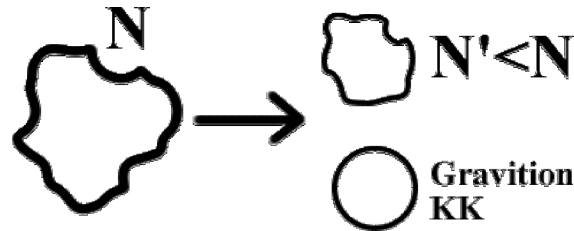
Lambert, Liu, Maldacena, hep-th/0303139

$$N_{max} \sim \frac{1}{g_s^2}$$

How does energy from closed strings partition into low energy degrees of freedom?

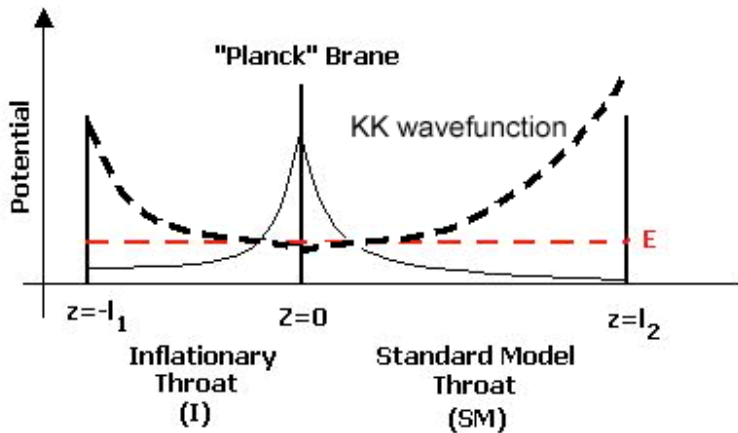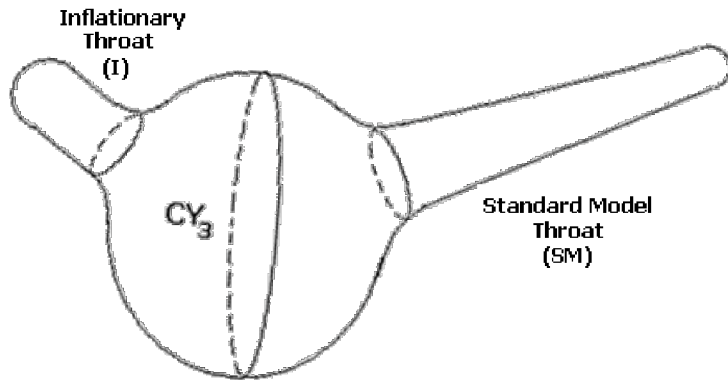

N

N'<N

Gravition
KK

Decay of Massive Closed Strings

Average over initial
and final state

$$\Gamma_g \sim g_s^2 \Omega \left(\frac{N_0}{2\sqrt{N}}\right)^3 e^{-2a(\sqrt{N}-\sqrt{N-N_0})}$$

$$\Gamma_{KK} \sim g_s^2 \Omega h_i^{-2} \left(\frac{N_0}{2\sqrt{N}}\right)^2 e^{-2a(\sqrt{N}-\sqrt{N-N_0})} \sum_{n=1}^{\infty} \sqrt{\frac{N_0^2}{4N} - m_{kk}^{(n)2}}$$

- KK modes suppressed by phase space
  - Graviton overproduction? $\Omega_{GW} < 10^{-6}$
  - Enhanced Coupling of KK at tip of throat
- Timescale is Short: $\Delta t \sim h_i^{-2} m_s^{-1}$

Transfer of Energy to SM

- Multithroat models: turn on closed string fluxes on conifold cycles.

- KK wavefunction enhanced at tip of AdS throat.

Barnaby, Burgess, Cline, hep-th/0412040

Kofman, Yi, hep-th/0507257

Dimopoulos, Kachru, Kaloper, Lawrence, Silverstein, hep-th/0106128

KK modes must tunnel through potential barrier

$$\Gamma_{tunn} \sim (Prob)(flux) \sim h_i^5 k$$

Reheat Temperature: $10^{13}\ GeV \leq T_{RH} \leq 10^{14}\ GeV$

Outlook

- ## Simple picture modified: Reheating Possible
  - KS throat Firouzjahi, Tye, hep-th/0512076
  - Tunneling Details Langfelder, hep-th/0602296

- ## Dynamical Throats: Stringy Reheating?
  - Frey, Mazumdar, Myers, hep-th/0508139

- ## Single Throat: DD$\bar{\text{D}}$ System?

- ## Relativistic Reheating in DBI scenario